

New species of Trochidae (Mollusca, Gastropoda) from the Cape Verde archipelago

Nuevas especies de Trochidae (Mollusca, Gastropoda) del archipiélago de Cabo Verde

Emilio ROLÁN* and José TEMPLADO **

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ABSTRACT

Few species of trochids have been found in the Cape Verde Archipelago. Two of them (*Osilinus atratus* and *Gibbula senegalensis*) are wide-spread along the West African coast, as well as being common in shallow waters of this Archipelago. Another (*Gibbula corallioides*) is a circalittoral species that appears to be endemic to the Cape Verde islands. In addition, four species (three of the genus *Gibbula* and one of *Jujubinus*) are considered undescribed and the present work is focused on their description. Two of these species are common in shallow waters of most islands. Two reddish forms of *Jujubinus* from deeper water are also found, but they remain undescribed, due the scarcity of material studied.

RESUMEN

Son pocas las especies de la familia Trochidae encontradas en el litoral del archipiélago de Cabo Verde. Dos de ellas (*Osilinus atratus* y *Gibbula senegalensis*) están ampliamente distribuidas por las costas del oeste de África y son también comunes en las aguas someras de este archipiélago. Otra (*Gibbula corallioides*) es una especie circalitoral que parece ser endémica de estas islas. Además, se han encontrado cuatro especies consideradas como nuevas para la ciencia (tres del género *Gibbula* y una de *Jujubinus*), en cuya descripción se centra el presente trabajo. Asimismo, se mencionan dos formas rojizas de *Jujubinus* que permanecen sin describir, debido al poco material de las mismas estudiado.

Key words: Trochidae, *Gibbula*, *Jujubinus*, *Osilinus*, new species, Cape Verde Islands, West Africa.

Palabras clave: Trochidae, *Gibbula*, *Jujubinus*, *Osilinus*, nuevas especies, islas de Cabo Verde, África occidental.

INTRODUCTION

Since the publication of the book by BURNAY AND MONTEIRO (1977) and the catalogue by COSEL (1982) on the marine molluscs of the Cape Verde Archipelago, the marine gastropods from these

islands have been the subject of a considerable number of papers, in which many groups have been revised (see BURNAY AND COSEL, 1987, ROLÁN AND RUBIO, 1999 and ROLÁN AND LUQUE,

* Cánovas del Castillo 22, 36202 Vigo, Spain

** Museo Nacional de Ciencias Naturales (CSIC), José Gutierrez Abascal 2, 28006 Madrid, Spain

2000 for a list). As a consequence of this work, about 200 new species have been described. However, the family Trochidae has not received any attention, and no trochid species have been described from these islands since the 19th century. It is therefore not surprising that some common trochids are currently undescribed.

As CURINI-GALLETI (1985) pointed out, Atlantic archipelagos harbour fewer trochid species than southern Europe and continental West Africa. Twelve species of this family are included in the catalogue of COSEL (1982): three of the genus *Solariella*; three of *Gibbula*, *G. corallioides* (Locard, 1898), *G. senegalensis* Menke, 1853 and *G. gorgonarum* P. Fischer, 1883; one of *Monodonta*, *M. punctulata* (Lamarck, 1822); one of *Calliostoma*, *C. conulus* (Linné, 1758) (with doubts); three of *Jujubinus*, *J. exasperatus* (Pennant, 1777), *J. striatus* (Linné, 1758) and *J. gravinae* (Monterosato, 1884); and finally, *Clelandella miliaris* (Brocchi, 1814). Of these species, *G. gorgonarum*, *Clelandella miliaris* and the three *Solariella* species are deep-water species. After this catalogue the only mention of Cape Verde trochids was in GUERREIRO AND REINER (2000). This book included only three species: *Gibbula magus* form *corallinoides* (sic), *Gibbula senegalensis* Menke, 1853, and *Monodonta atrata* Wood, 1828.

Several trochid species have been collected during many trips to the Cape Verde archipelago (from 1978 to 2001). Regarding the littoral species, our observations verify the presence of *Osilinus atratus* Wood, 1828) (usually recorded as *M. punctulata* in most of the works on these islands), *Gibbula senegalensis*, and *Gibbula corallioides*. The former two species are widely distributed along the west African coast, and they are also very common in the Cape Verde Archipelago. On the other hand, *Gibbula corallioides* is a less common circalittoral species, recorded by DAUTZENBERG AND FISCHER (1906), MARCHE-MARCHAD (1958) and SAUNDERS (1977). In addition, some forms of *Jujubinus* to which Euro-

pean names have been applied are also common. However, we consider them to be clearly different species. Finally, we have found three species of *Gibbula* previously undescribed, despite the fact that one of them is apparently a common littoral species in all the islands. The present work focused on these littoral Trochidae considered by us to be new species: three of the genus *Gibbula* and one of *Jujubinus*.

MATERIAL AND METHODS

The present work is based on the material and data obtained by the first author from eleven trips to the Cape Verde archipelago during the last 25 years, including the "I Expedición Científica Ibérica al Archipiélago de Cabo Verde" (1985) (IEIACV), in which the two authors participated. Most of the material was collected by skin diving to a depth of 10 m, and some additional material was obtained by dredging down to 100 m. Trochids from different areas of Europe and West Africa in MNCN and CER have been used for comparison.

The type material has been deposited in the institutions mentioned in the text; the material coming from the IEIACV is deposited at DBUA, and the rest in the collection of the first author (not specify in the text).

Abbreviations:

- MNCN Museo Nacional de Ciencias Naturales, Madrid
- MNHN Muséum National d'Histoire Naturelle, Paris
- AMNH American Museum of Natural History, New York
- DBUA Departamento de Biología, Universidad Autónoma, Madrid
- CER collection of Emilio Rolán, Vigo
- H height of the shell
- d diameter of the shell
- j juvenile shells
- s empty shells
- sp specimens collected alive

RESULTS

Family TROCHIDAE Rafinesque, 1815
Genus *Gibbula* Risso, 1826

Among the material studied by us, we recognize five species belonging to the genus *Gibbula*. Two of them are the two species previously recorded in the Cape Verde Islands, *G. senegalensis* and *G. corallioides*. The former is a common shallow water species, found in sheltered areas of most islands. It is clearly distinguished from the other species by its pattern of black-orange-white bands with irregular white blocks in the shell (Figs. 3-4). *G. corallioides* has been collected mainly by dredging deeper than 20 m. This species is similar to the European *G. magus* (L., 1758) and it has often been considered as a synonym of this last one

(e.g. in GUERREIRO AND REINER, 2000). We consider it as valid species due its smaller size and the constant differences in the colour pattern of the shell (Figs. 1, 2) and soft parts. It seems to be an endemic species from Cape Verde islands.

The other three species found by us are considered undescribed species. One of them is very common in exposed rocky areas in shallow waters and its elevated profile resembles a species of *Jujubinus*. The other two species are less common, restricted to one or two islands, and vaguely resemble to the European *G. tumida*-*G. racketti*. Below we describe these three species as new.

Gibbula verdensis n. sp. (Figs. 5-10, 36-41, 53-57)

Type material: Holotype (Figs. 5-7) and 2 paratypes in MNCN (catalog number 15.05/44458). Other paratypes in the following collections: MNHN (2); AMNH (2); CER (127), all from the type locality.

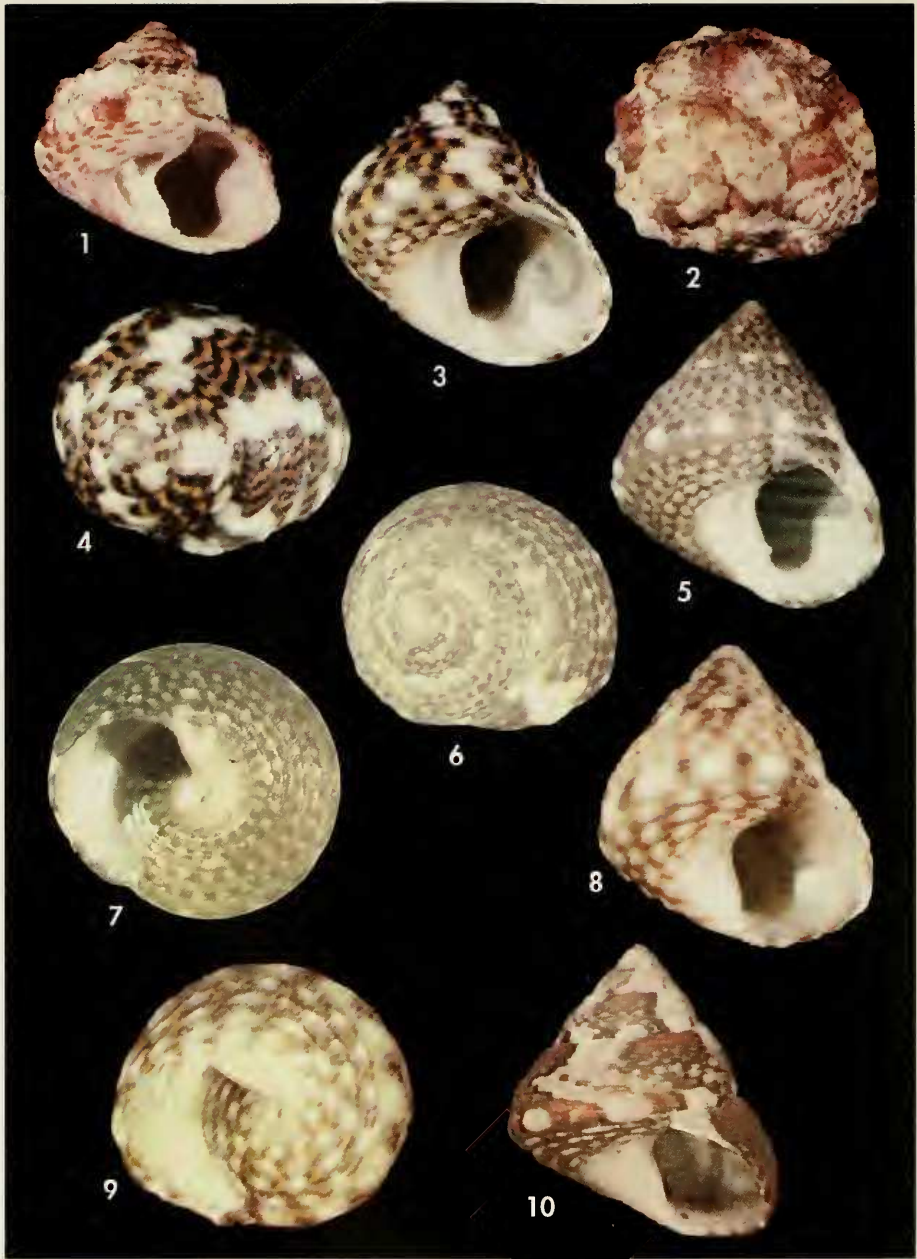
Other material studied: Sal: 25 sp, 15 s, 45 j, Regona, 1-3 m; 5 sp, Regona (DBUA); 22 sp, Santa Maria, 1-2 m; 77 sp, 25 s, 28 j, Rabo de Junco, 0-1 m; 1 sp, 5 j, Mordeira, 1-2 m; 6 sp, Mordeira (DBUA); 4 sp, 2 j, Serra Negra, 1-3 m; 3 s, 20 j, Palmeira, 6-8 m; 10 sp, Fontona, 1-2 m; 1 sp, 2 j, Fontona (DBUA); 2 sp, 15 j, Parda, 0-1 m; 3 sp, Palhona, 1 m; 1 sp, Monte Leste, 1 m; 1 sp, Pesqueiro do Air, 1 m; 2 sp, Santa Maria (DBUA), 2 sp, Fiura (DBUA); 1 sp, Guincho do Ninho (DBUA). Boa Vista: 1 sp, Sal Rei (DBUA); 28 sp, 14 s, 16 j, Sal Rei, 1-3 m; 1 sp, 2 s, 30 j, 3 f, Ilheu Sal Rei, 2-5 m; 7 j, Baía Teodora, 1 m; 4 j, Rife de Chaves, 6 m; 16 sp, Baía da Gata, 2-4 m; 4 sp, 2 s, Derrubado, 1-3 m. Maio: 5 s, 2 j, Navio Quebrado, 4 m; 5 sp, Galeão, 2 m; 1 s, 7 j, Baijos de João Valente, 4 m; 3 s, Pau Seco, 1-4 m. Santiago: 3 sp, Calheta de San Miguel, 4 m; 4 sp, 5 s, 18 j, 3 f, Tarrafal, 3-5 m; 1 sp, Punta Geneanes, 2-5 m. Brava: 3 s, 20 j, Pedrinha, 1-4 m; 12 s, 46 j, Furna, 2-8 m; 6 sp, 36 j, Porto do Anciã, 4 m. Fogo: 1 j, San Felipe, 30 m. São Vicente: 19 j, Porto Mindelo, 15 m; 1 sp, Saragaça (DBUA). Santa Luzia: 1 sp, Agua Doce (DBUA). Ilheu Branco: 2 sp (DBUA).

Type locality: Sal Rei, Boa Vista Island, Cape Verde Archipelago.

Etymology: The specific name refers to the archipelago where it is a common species in shallow waters.

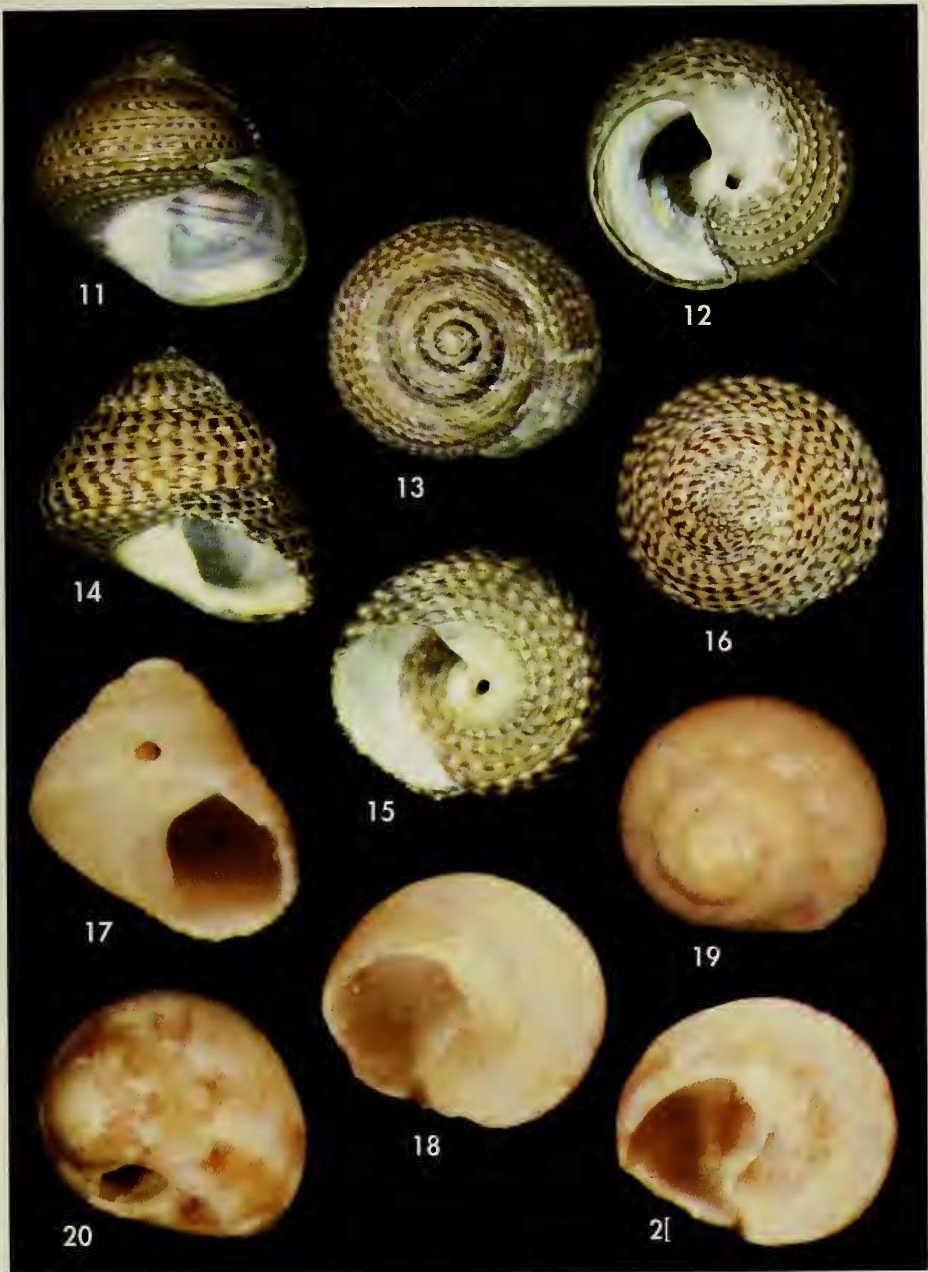
Description: Shell (Figs. 5-10) solid, elevate-conical, with high spire that provides a general aspect and profile similar to a *Jujubinus*. Protoconch (Figs. 36-41) with less than one whorl, surface rough with three fine threads obliquely disposed; usually lighter in colour. Teleoconch of about 3-4 whorls, which have 2-4 spiral cords in first whorl, about 5 on the last whorl, and 4-5 at the base,

below the peripheral angulation. This angulation is very evident in juveniles but is more attenuated in larger specimens. The lower spiral cord in each whorl is stronger and wider than the others. Columella slightly prosocline; columellar area white, with a small prominence below the middle. Aperture rounded, greenish, nacreous at the interior. Umbilical area white with a very



Figures 1,2. *Gibbula corallioides* (12,1 mm), Guincho do Ninho, Sal Island. Figures 3, 4. *Gibbula senegalensis* (6,5 mm), Mordeira, Sal Island. Figures 5-10. *Gibbula verdensis* n. sp. 5-7: holotipo (4,5 mm), Sal Rei, Boa Vista Island; 8, 9: concha de Derrubado, Boa Vista Island; 10: paratipo, Sal Rei, Boa Vista Island.

Figuras 1, 2. Gibbula corallioides (12,1 mm), Guincho do Ninho, isla de Sal. *Figuras 3, 4. Gibbula senegalensis* (6,5 mm), Mordeira, isla de Sal. *Figuras 5-10. Gibbula verdensis* n. sp. 5-7: holotipo (4,5 mm), Sal Rei, isla de Boa Vista; 8, 9: concha de Derrubado, isla de Boa Vista; 10: paratipo, Sal Rei, isla de Boa Vista.



Figures 11-16. *Gibbula sementis* n. sp. 11, 12: holotype (5.0 mm), Punta Geneanes, Santiago Island; 13: paratype, Punta Geneanes, Santiago Island; 14-16: shell from Furna, Brava Island. Figures 17-21. *Gibbula clandestina* n. sp. 17-19: holotype (1.9 mm), Palmeira, Sal Island; 20, 21: paratype, Palmeira, Sal Island.

Figuras 11-16. *Gibbula sementis* n. sp. 11, 12: holotipo (5,0 mm), Punta Geneanes, isla de Santiago; 13: paratipo, Punta Geneanes, isla de Santiago; 14-16: concha de Furna, isla de Brava. Figuras 17-21. *Gibbula clandestina* n. sp. 17-19: holotipo (1,9 mm), Palmeira, isla de Sal; 20, 21: paratipo, Palmeira, isla de Sal.

narrow umbilicus, sometimes as a small furrow. The shell colour is variable. Most of the darker shells appear grey-greenish, but with magnification it is clear that this colour is not uniform, and grey or greenish rectangles alternating with yellow ones on the spiral cords. In lighter shells, the rectangles of the cords are alternating red, and cream or white. They are sometimes larger than those in the darker shells and there is light green in the interspaces. Some specimens are almost cream or white, or white with grey blotches. There are intergradations between the different colour patterns. This variability can be observed within the same population, but no remarkable differences have been observed among samples from different islands.

Size: up to 7 mm. Mean values: H= 5.75 mm, d= 5.09, H/d= 1.13 (n= 20 adult shells). The holotype measures 4.7 x 4.6 mm.

Soft parts: Head and lateral parts of the foot blackish, sometimes with some white blotches; sole of the foot cream. Cephalic tentacles finely micropapillated, blackish with a darker line mid-dorsally. Eye stalks relatively short and thick, with terminal eyes. In adult specimens a white circle with a digitiform and short postoptic tentacle has been observed immediately behind the right eye stalk. Snout short and broad. Cephalic lappets small and simple. Neck lobes lighter in colour, being dark greenish at their base, with some silvered blotches on the dorsum. Anterior margin of the right neck lobe partially fused with the basal portion of the right eye stalk and with the right cephalic lappet. Margin of the right neck lobe almost smooth, while the left one is

somewhat fringed. There are three pairs of blackish epipodial tentacles, with two white, rounded epipodial sense organs at their base. Another conspicuous rounded and white epipodial sense organ is located under the right neck lobe.

Operculum (Figs. 54-55) multispiral and almost transparent.

Radula (Figs. 56-57) as in other species of the genus, with the rachidian tooth with a narrow shaft and reduced cusp.

Habitat: Usually found under rocks in shallow water of exposed areas. In the same habitat but in sheltered areas it is replaced by *G. senegalensis*.

Distribution: Known from most of the islands of the Cape Verde Archipelago.

Discussion: The profile of the shell of this species is similar to *Jujubinus* species and differentiates it from most species of *Gibbula* from Europe and West Africa. The only species of this genus with a similar high spire is *G. cineraria* (Linné, 1758), from the Atlantic coast of Europe, but this species is notably larger. The other common, sympatric species of *Gibbula*, *G. senegalensis* (Figs. 3-4) is clearly different, with a more depressed spire, larger last whorl, very small umbilicus, and with black, orange and white rectangles on the spiral cords of the base. In the other hand, *G. verdensis* can be differentiated from all species of *Jujubinus* by its small but always evident umbilicus, and by the partial fusion of the right neck lobe with the right eye stalk. In addition, *G. verdensis* lives on rocky surfaces, while species of *Jujubinus* live among seaweeds and sea grasses (HICKMAN AND McLEAN, 1990).

Gibbula sementis n. sp. (Figs. 11-16, 42-45)

Type material: Holotype (Figs. 11-12) and 2 paratypes in MNCN (catalog number 15.05/44459). Paratypes in the following collections: MNHN (2); AMNH(2); CER (19), all from the type locality.

Other material studied: Brava: 11 s, Furna, 15-30 m; 5 f, 6 j, Porto do Ancião, 8 m.

Type locality: Ponta Geneanes, Santiago Island, Cape Verde Archipelago.

Etymology: The specific name alludes to the similarity of the shell with a seed.

Description: Shell (Figs. 11-16) small, solid, roundly top-shaped. Protoconch

(Figs. 42-45) with less than one whorl, usually dark in colour; surface rough

with three narrow threads which are not in spiral arrangement, but oblique. Teleoconch of about 3 convex whorls, without remarkable angulation; suture impressed. Spirally sculptured with 3-4 fine spiral cords in first whorls and between 12-15 in the last one. There is not a more prominent peripheral cord. Columella orthocone; columellar area white, without any prominence. Aperture rounded, bluish iridescent in the interior. Umbilical area white, sometimes bordered with light green, with an evident deep umbilicus. The shell colour is a rather uniform olive-green, with small whitish spots on the spiral ribs in most of the species.

The shells from Brava Island (Figs. 14-16) are somewhat different, with stronger spiral threads, more angulated whorls and with reddish-brown and yellowish spots alternating on the spiral cords. We consider these differences as intraspecific variability between populations of different islands.

Gibbula clandestina n. sp. (Figs. 17-21, 46-47)

Type material: Holotype (Figs. 17-19) in MNCN (catalog number 15.05/44460). Paratypes in the following collections: MNHN (1) (Figs. 20-21); AMNH (1); CER (10), all from the type locality.

Type locality: Palmeira, Sal Island, Cape Verde Archipelago.

Etymology: The specific name refers to the fact that this species may be confused at first sight with juveniles of other congeneric, and because it is very uncommon.

Description: Shell (Figs. 17-21) minute, solid, roundly top-shaped, somewhat depressed. Protoconch (Figs. 46-47) with less than one whorl, usually dark with rough surface and with three fine threads which are not spiral, but oblique. Teleoconch of about 4 whorls, somewhat convex subsuturally. Sculpture consisting of 3 very fine spiral cords in the first whorl, 8 in the second, and about 19 in the body whorl, one of them more prominent and making a slight angulation in the periphery. Aperture rounded, shiny in the interior. Columella curved, almost orthocone at its lower part, where a small prominence is present. Umbilical area cream-white with a narrow umbilicus. Shell colour cream with irregular light brown

Size: up to 6.1 mm the larger specimens. Mean values: H= 4.12 mm, d= 4.6, H/d= 0.89 (n= 20 adult shells). The holotype measures 5.0 x 4.7 mm.

Soft parts: Not observed.

Habitat: On rocks with small seaweeds in shallow water.

Distribution: Only known from Santiago and Brava Islands.

Discussion: The species is clearly different from all others in this genus from Europe and West Africa. It slightly resembles *G. candei* (D'Orbigny, 1838), from the Canary Islands, but the latter species is notably larger, with shouldered whorls and different colour pattern, often with pinkish tints. *G. sementis* can be distinguished from *G. verdensis* (described above) because the latter has a higher spire, flattened profile of the whorls, smaller umbilicus and suture not impressed. Both species are sympatric in Santiago. *G. senegalensis* is more depressed, lacks a clear umbilicus and the colour of the spiral cords is white, orange and black.

and whitish blotches axially. The subsutural area and the more prominent spiral cord of the periphery are whitish with light brown spots. The light brown pigmentation becomes pinkish in some shells.

Size: up to 2.4 mm. Mean values: H= 1.95 mm, d= 1.90, H/d= 1.02 (n= 10 adult shells). The holotype measures 1.9 x 2.0 mm.

Soft parts: Unknown.

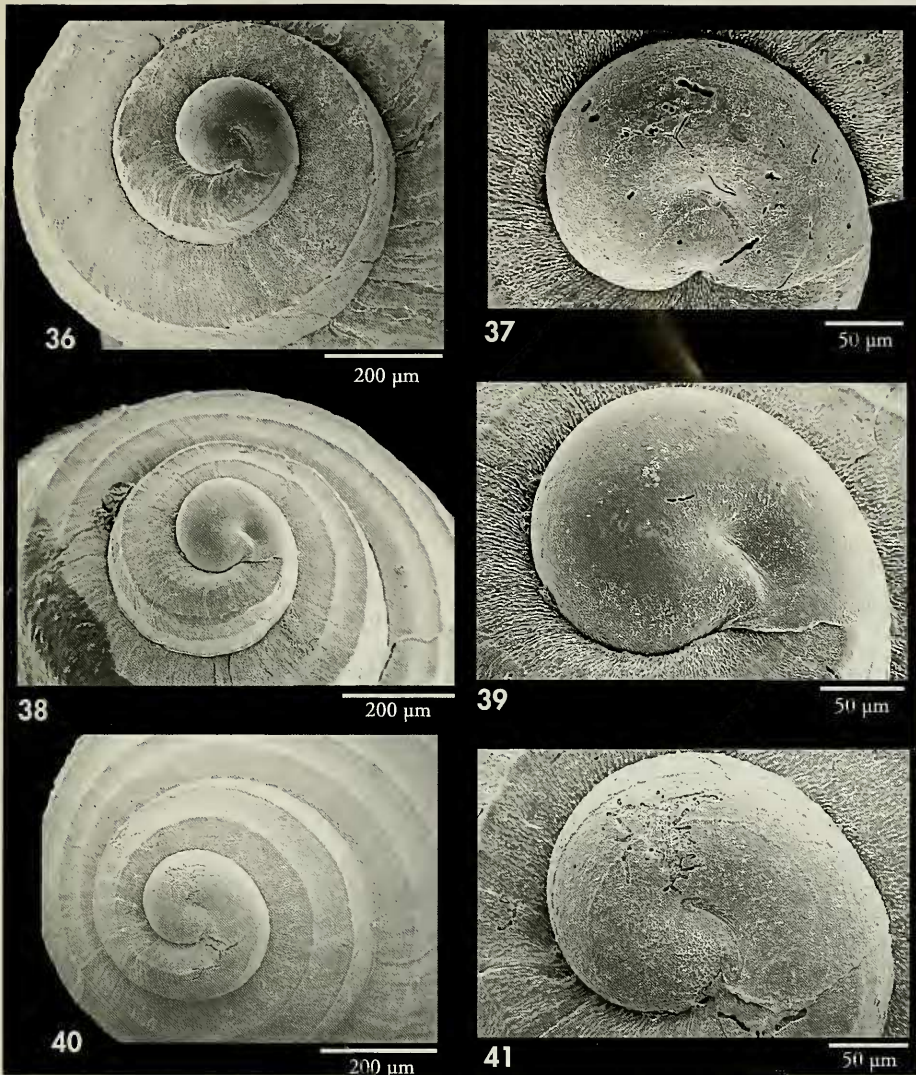
Habitat: Unknown. Empty shells were collected in sediments from 15 to 50 m in depth.

Distribution: Known only from Sal Island.

Discussion: The most similar species are the European *Gibbula tumida* (Montagu, 1803) and *G. racketti* (Pay-



Figures 22-27. *Jujubinus rubioi* n. sp. 22-24: holotype (4,9 mm), Mordeira, Sal Island; 25-27: paratypes of the same locality. Figures 28-31. *Jujubinus* sp. 1. 28-30: shell (3,7 mm) from Palmeira, Sal Island, 50 m; 31: shell (3,2 mm) from Ilheu Branco, 50 m. Figures 32-35: *Jujubinus* sp. 2. 32: shell (2,8 mm), Ilheu Branco, 50 m; 33: shell (3,5 mm), Pau Seco, 30 m; 34, 35: shell (2,4 mm), Fogo, 30 m. *Figuras 22-27. Jujubinus rubioi* n. sp. 22-24: holotipo (4,9 mm), Mordeira, isla de Sal; 25-27: paratipos de la misma localidad. *Figuras 28-31. Jujubinus* sp. 1. 28-30: concha (3,7 mm) de Palmeira, isla de Sal, 50 m; 31: concha (3,2 mm) de Ilheu Branco, 50 m. *Figuras 32-35: Jujubinus* sp. 2. 32: concha (2,8 mm), Ilheu Branco, 50 m; 33: concha (3,5 mm), Pau Seco, 30 m; 34, 35: concha (2,4 mm), Fogo, 30 m.

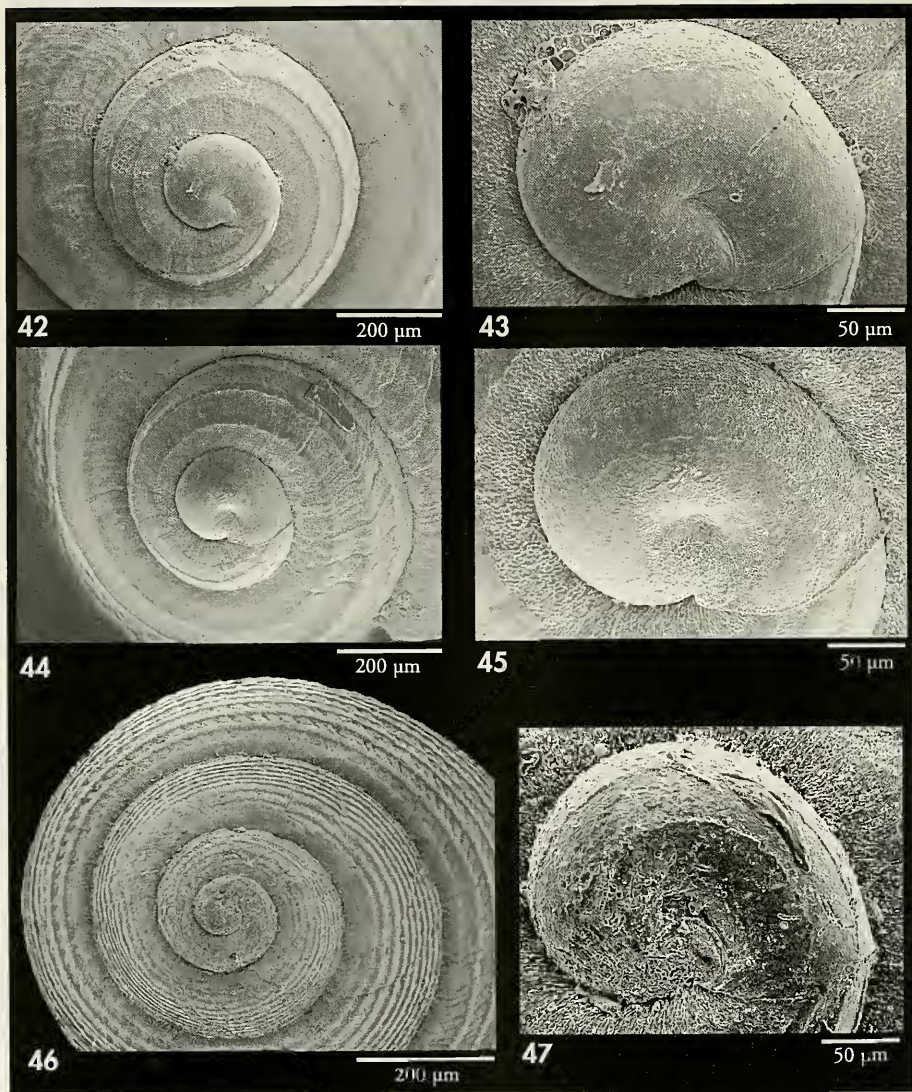


Figures 36-41. *Gibbula verdensis*, protoconchs. 36, 37: Sal Rei, Boa Vista; 38, 39: Rabo de Junto, Sal; 40, 41: Furna, Brava.

Figuras 36-41. Gibbula verdensis, protoconchas. 36, 37: Sal Rei, Boa Vista; 38, 39: Rabo de Junto, Sal; 40, 41: Furna, Brava.

raudeau, 1927), but they are larger, with stronger and more irregular spiral cords. The umbilicus is wider in *G. racketti*. Furthermore, *G. tumida* has a smooth protoconch (see RODRÍGUEZ BABIO AND THIRIOT-QUIÉVREUX, 1975, plate 2, fig 1).

The West African species *G. joubini* Dautzenberg, 1910 is similar in colour but larger, with a lower number of spiral cords, which are more prominent. The angulation on the body whorl is more evident and the umbilicus wider in this last species.

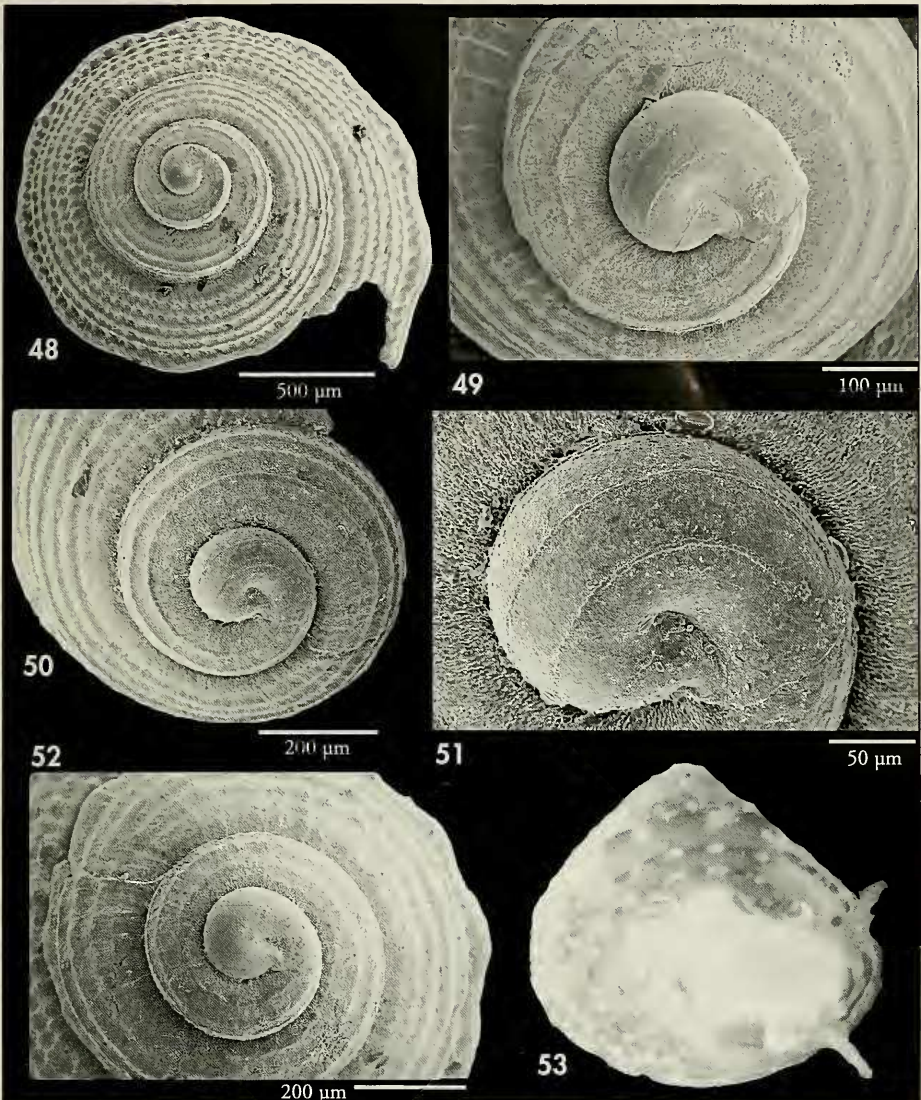


Figures 42-45. *Gibbula sementis*, protoconchs. 42, 43: Punta Geneanes, Santiago; 44, 45: Furna, Brava. Figures 46, 47. *Gibbula clandestina*, protoconch, Palmeira, Sal, 30 m.
Figuras 42-45. *Gibbula sementis*, protoconchas. 42, 43: Punta Geneanes, Santiago; 44, 45: Furna, Brava. Figuras 46, 47. *Gibbula clandestina*, protoconcha, Palmeira, Sal, 30 m.

Genus *Jujubinus* Monterosato, 1884

This genus is widespread along the coasts of Europe and West Africa, from Norway to Angola. According to CURINI-GALLETTI (1985), a number of

highly variable and phenotypically scarcely distinguishable species are found within this large area. Along the European coast the species of *Jujubinus* have



Figures 48, 49. *Jujubinus rubioi*, protoconchs. 48: Palmeira, Sal; 49: Sal Rei, Boa Vista. Figures 50, 51. *Jujubinus* sp. 1, São Felipe, Fogo. Figure 52. *Jujubinus* sp. 2, Palmeira, Sal, 30 m. Figure 53. *Gibbula verdensis*, Mordeira, Sal, soft parts.

Figuras 48, 49. *Jujubinus rubioi*, protoconchas. 48: Palmeira, Sal; 49: Sal Rei, Boa Vista. Figuras 50, 51. *Jujubinus* sp. 1, São Felipe, Fogo. Figura 52. *Jujubinus* sp. 2, Palmeira, Sal, 30 m. Figura 53. *Gibbula verdensis*, Mordeira, Sal, partes blandas.

been relatively well studied (see the complete review of CRETELLA, 1992-1993), meanwhile they are poorly known in West Africa. A new species of this genus (*J. fulgor*) has been described

from Angola by GOFAS (1991), but no other paper has been devoted to *Jujubinus* from the West African mainland. CURINI-GALLETI (1985) pointed out that the northeastern Atlantic archipelagos

(Macaronesia) have in general a high level of endemism of *Jujubinus* species. At present one species is known to be endemic to the Azores (*J. pseudogravinae* Nordsieck, 1973), one to Madeira (*J. vexationis* Curini-Galletti, 1990), two to the Canaries (*J. guanchus* Curini-Galletti, 1985 and *J. poppei* Curini-Galletti, 1985), and none are known from the Cape Verde Islands.

As we commented before, three of the most common and widespread European species have been recorded from the Cape Verde Islands. In fact, we have found three probable different species of *Jujubinus* in these islands. One of them is very common in shallow waters and wide-spread within the whole archipelago. It resembles *J. gravinae*, but it is

clearly a different species (described below). The other two reddish species are much more scarce, and are found in deeper water. One of them, *Jujubinus* sp. 1 (Figs. 28-31, 50-51), may be a deeper-water form of the former species, and the other, *Jujubinus* sp. 2 (Figs. 32-35, 52), belongs to a different group of species (*J. exasperatus* species-group), to which *J. fulgor*, from Angola, also belongs. To reach a definitive conclusion about the taxonomic status of these two reddish forms of *Jujubinus* a complete revision of similar species from West Africa and Macaronesia would be necessary. It is also necessary to take into account the polytypic trends of most species in the genus. This is not within the scope of the present work.

Jujubinus rubioi n. sp. (Figs. 22-27, 48-49)

Type material: Holotype (Figs. 22-24) and 1 paratype (Figs. 26, 27) in MNCN (catalog number 15.05/44459). Paratypes in the following collections: MNHN (2); AMNH (2); CER (19), all from the type locality.

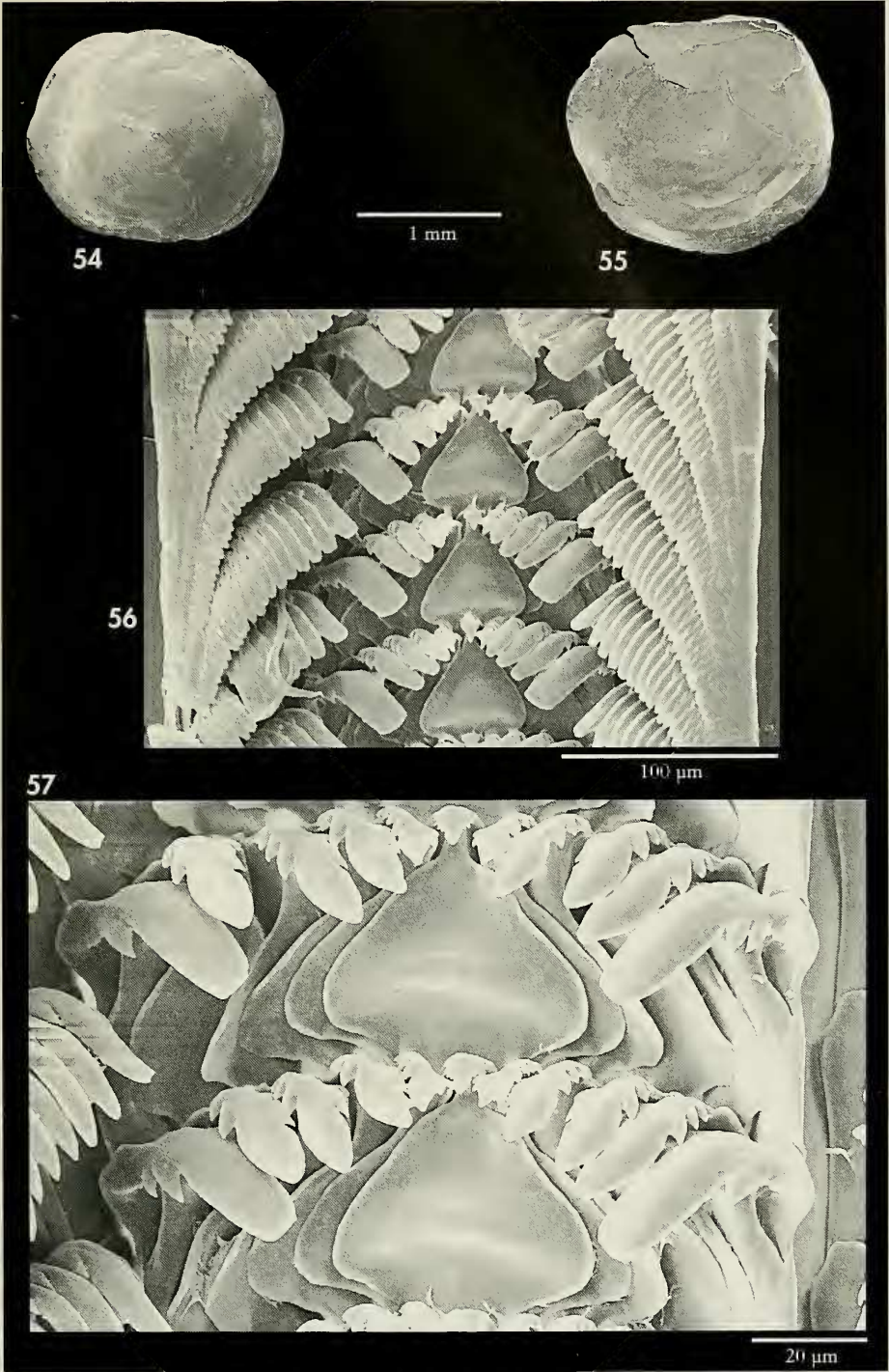
Other material studied: Sal: 1 sp, 1 j, Calheta Fonda, Sal, 4 m; 25 c, 16 j, Palmeira, 10-15 m; 11 sp, Palmeira (DBUA); 6 s, 6 j, Regona, 2-6 m; 10 j, Rabo de Junco, 2-6 m; 1 sp, 1 s, Monte Leste, 1 m. Boa Vista: 13 s, 13 j, 5 f, Sal Rei, 1-8 m; 2 s, 4 j, Ilheu Sal Rei, 8 m; 2 s, Santa Maria, 30 m. Santiago: 1 sp, 3 s, Praia, 10m; 2 s, 12 j, 1 f, Tarrafal, 4 m; 10 j, Tarrafal, 30 m; 3 s, 16 j, Cidade Velha, 4-6 m; 5 j, Pedra Badejo, 4 m. São Vicente: 12 j, Porto Mindelo, 15 m; 1 s, 6 j, Salamança, 3 m. São Nicolau: 6 s, 3 j, Tarrafal, 6 m. Fogo: 1 s, 7 j, San Felipe, 20-30 m. Brava: 5 s, 4 j, Furna, 8-15 m; 1 sp, 6 s, 2 j, Furna, 25-30 m; 5 j, Pedrinha, 6 m.

Type locality: Mordeira Bay, Sal Island, Cape Verde Archipelago.

Etymology: The species is named after a good friend, Federico Rubio, for his important contribution to the knowledge to the Trochoidea of West Africa.

Description: Shell (Figs. 22-27) conical, solid, thick, remarkably shiny, with flattened or only slightly convex whorls and convex basis. Protoconch (Figs. 48-49) usually white in colour, with less than one whorl, surface rough with three fine threads not arranged spirally, but obliquely. Teleoconch of about 5-6 whorls, the two uppermost with 3-4 flattened and smooth spiral cords and 6 in the penultimate. Basal threads well developed, wider than the others, being formed by a group of several small cords; markedly crenulated, resulting in a wavy peripheral ridge. Furrows narrower than the threads and crossed by numerous growth lines strongly pro-

socline, raised almost as true lamellae. About 6-7 coloured basal concentric ridges, narrower than the furrows, with another thinner colourless ridge between them. Aperture almost rectangular with a vertical columella and a small elevation on its lower part. Umbilicus absent. Inner part of the aperture very nacreous. Shell vividly coloured. Most specimens with a cream to light green background colour, with some irregular white axial blotches and greenish-brown or light olive-green flammules. Spiral cords dotted with burgundy or greenish-brown and white. The crenulations of the lower cord and the undulations of the peripheral ridge are



Figures 54-57. *Gibbula verdensis*, Mordeira, Sal. 54, 55: operculum; 56, 57: radula.
Figuras 54-57. *Gibbula verdensis*, Mordeira, Sal. 54, 55: operculum; 56, 57: rádula.

highlighted, being whitish on a darker background. Almost white, pinkish, or greyish specimens can be found.

Size: Larger shells reach up to 6 mm. Mean values: H= 5.12 mm, d= 4.20, H/d= 1.16 (n= 20 adult shells). The holotype measures 4.9 x 3.9 mm.

Soft parts: Head-foot brightly pigmented with light violet, pinkish, green or intense yellow irregular spots over a yellowish or cream background body colour. Foot broad, truncated anteriorly, and tapered posteriorly. Sole of the foot whitish. Long cephalic tentacles, micropapillated, semi-transparent with bluish shades. Epipodium well developed. Three pairs of long and extensible epipodial tentacles, very active when the animal is crawling. They are micropapillated and semitransparent with some whitish pigmentation. Two white epipodial sense organs are present one above and the other below the base of each tentacle. Neck lobes semitransparent with some irregular white pigmentation, not fused with the eye stalks. The margin of the right neck lobe is smooth, but the left one is irregular. An epipodial sense organ is present under each neck lobe. Cephalic lappets small and pointed, almost white.

Operculum multispiral, very thin and almost transparent.

Radula (not figured) as in other species of the genus.

Habitat: Among small seaweeds under or over the rocks, from the intertidal level to about 10 m in depth.

Distribution: Known in most of the Cape Verde Islands. Probably it is endemic to this archipelago.

Discussion: This new species shows most of the characters described for the *J. gravinae* species-group (see CURINI-GALLETTI, 1990 and CRETELLA, 1992), into which three species are recognized to date: the nominal species, *J. gravinae* (Dautzenberg, 1881), is widespread in

Lusitanian and Mauretanian regions including the Canary Islands, *J. karpat-hoensis* Nordsieck, 1973, is restricted to the southeastern Aegean Sea, and *J. vexationis* Curini-Galletti, 1990, is endemic to Madeira

J. rubioi can be differentiated from *J. gravinae*, because the latter has a protoconch with a single fine thread (CRETELLA ET AL., 1990, p. 60, fig. 10) (three in *J. rubioi*), higher H/d ratio, wider basal concentric ridges subequal to the furrows (thin and clearly narrower than the furrows in *J. rubioi*), somewhat different colour pattern of shell and soft parts, oak-leaf-shaped cephalic lappets (small and pointed in *J. rubioi*), and left neck lobe with finely scalloped margin (somewhat irregular in *J. rubioi*) (CRETELLA ET AL., 1990, and own observations).

J. vexationis, from Madeira, has a similar H/d ratio to *J. rubioi*, but according to its original description (CURINI-GALLETTI, 1990), it has a higher number of spiral threads, which are narrower than in *J. rubioi*, a thinner basal thread, and a more convex basis.

CURINI-GALLETTI (1990) postulated that the widespread species *J. gravinae* gave rise to a distinct species in the Madeira Archipelago, while the Canary specimens are phenotypically linked to Western Mediterranean populations. He noted that this is probably due to the differences in distance from the mainland. The Canaries (closer to the continent) are "in general comparatively easier to colonize, and consequently less liable to promote speciation" (CURINI-GALLETTI, 1990). In the same way, *J. rubioi* may come from a common ancestor of species in the *J. vexationis* group, which once colonized the Cape Verde Islands, and subsequently became a distinct species by progressive speciation, due the great distance from the West African mainland (about 450 km).

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